

Much of the background art concerning the application of information technology to sport focuses on providing retrospective feedback to both the athlete and coach. That is, the majority of such devices are typically used solely as testing tools, rather than actually providing a training stimulus. The sport and exercise environments are becoming increasingly populated with electronic devices for measuring physical performance and biological responses to various types of physical performance tasks. While these devices are able to provide feedback information on various aspects of physical, tactical, and skill based performances, they do not provide direct stimuli for improving training efficacy. As such, these disparate devices do not stimulate the cognitive or tactical aspects of athletic performance such as decision making, reaction time, peripheral vision or environmental awareness that are crucial in the sporting context.

At present, many aspects of sports training and testing are performed manually with considerable subjective elements and potential for bias due to human error. Of the automated fitness test protocols that exist, most of these must be performed in a controlled laboratory environment due to the expense, size and complexity of the equipment involved. These tests, furthermore, are generic in nature and often not specific to the demands of the sport for which they are used.

20 SUMMARY OF THE INVENTION

Object of the Invention

It would be advantageous to provide a training and testing method, apparatus and system that conveniently provides a training stimulus, measures the outcome/performance, and reports the outcome to the athlete or trainer, desirably in real time.

Disclosure of the Invention

This invention, in one broad aspect, resides in a sports training and testing method for at least one athlete, said method including the steps of:

30 initiating within a control unit a predetermined protocol for training and testing, which protocol comprises layout information for locations of a plurality of remote units and at least one sensor, and route or game plan information for said at least one athlete relative to the plurality of remote units;

- instructing said plurality of remote units to produce a series of stimuli for said at least one athlete in accordance with the route or game plan information;
receiving feedback information from said at least one sensor, said feedback information associated with said at least one athlete's response to the stimuli;
5 transmitting the feedback information to said control unit; and
automatically modifying further stimuli of the series of stimuli having regard to the route or game plan information and the response.

In another aspect, this invention resides in a sports training and testing apparatus for at least one athlete, said apparatus including:

- 10 a control unit adapted to implement a predetermined protocol, wherein the protocol comprises layout information for remote units and sensors and route or game plan information for said at least one athlete;
a plurality of remote units disposed in accordance with the layout information for providing a series of stimuli for said at least one athlete in accordance with the route or game plan information;
15 at least one sensor disposed in accordance with the layout information for providing feedback information associated with said at least one athlete's response to the stimuli to said control unit; and
20 a communications network providing communications between the control unit and the plurality of remote units including said at least one sensor, wherein further stimuli in said series of stimuli are automatically modified having regard to the route or game plan information and the response.

- 25 In a further aspect, this invention resides in a sports training and testing system for at least one athlete, said system including:

- initiating within a control unit a predetermined protocol for training and testing the user;
instructing a plurality of remote units to produce a series of stimuli to the athlete in response to the predetermined protocol;
30 receiving feedback information from at least one sensor, which feedback information is associated with the user's response to the stimuli;

automatically modifying further stimuli of the series of stimuli having regard to the feedback information;

transmitting the feedback information across a communications link to a remote terminal;

- 5 processing the received information within the remote terminal; and
storing the processed information in a memory.

In a still further aspect, this invention resides in a sports training and testing method including the steps of:

- 10 an on-field network having:
- a control unit adapted to implement a predetermined protocol for training and/or testing the user;
 - a plurality of remote units for providing a series of stimuli to said user in accordance with the predetermined protocol;
 - at least one sensor for providing feedback information associated with said user's response to the stimuli to said control unit, wherein further stimuli in the series of stimuli may be automatically modified having regard to the feedback information; and
- 15 a communications link coupling the on-field network to an off-field network,
- 20 the off-field network having:
- a terminal for receiving from said control unit via the communications link the feedback information for post processing; and
 - a memory for storing the post processed data.
- 25 A reactive sprinting and agility protocol may include measurement of start reaction time and sprinting time over a random course. A reactive offensive/defensive training protocol may include instructing an offensive player over a random course through a plurality of defensive players that are required to react to the offensive players accordingly without knowledge of said random
- 30 course. A group reactive training protocol wherein a group of players must complete a series tactical patterns or combinations of play over a random course, may include instructing a first player to move to a randomly selected gate and

allowing the remaining players in the group to initiate the most appropriate tactical move or pattern of play in response to the first players movement.

In a further grid training protocol, a small group of athletes (e.g. 3) may be directed through a course provided by a grid type configuration of a number of

5 stations either simultaneously or separately by stimuli specific to the respective athletes, for example 3 coloured lamps at each station in the grid. In a variation of the grid type protocol several small groups of athletes are directed through grid of stations and are further prompted to pass a ball, or other object amongst each other.

10 Preferably, the control unit is a computer, such as a portable computer, a personal digital assistant (PDA), palm top, mobile phone or other such suitably portable processing device.

Suitably the remote units receive instructions for producing the stimuli from the control unit either wirelessly or via a fixed connection. Each remote unit may 15 include means for identifying each participating athlete, such as by use of an ID tag.

The stimuli may be audio, visual, tactile or a combination thereof. Preferably, means for producing the stimuli are mounted on the remote units but may also be mounted separately to the remote units. Optionally the remote units 20 may include a data capture sub-unit having a memory. The remote unit may then receive feedback information from the sensors before forwarding the information to the control unit. The remote unit may act as an intermediate hop in the communications network.

In one form said at least one sensor may be integral with or coupled to the 25 remote unit. Alternatively said at least one sensor may be worn by the athlete. Preferably, the sensor is a biometric sensor, but the system may also utilise other sensor devices such as timers, pressure sensors, pedometers, accelerometers or the like.

The communication link may be a wireless link such as a Radio Frequency 30 (RF), GSM, CDMA, GPRS, Microwave, laser, Infra Red (IR), IEEE 802.11(Wireless Ethernet), Bluetooth™ or other such suitable wireless communication schemes. Alternatively, the communications link may be a wired connection such as RS232,

USB, LAN, WAN, Internet, Plain Switch Telephone Network (PSTN), Plain Old Telephone System (POTS), Integrated Services Digital Network (ISDN) or the like.

Preferably, the remote terminal is a workstation running suitable software for processing the sensor feedback data. The workstation may optionally include an 5 internet connection, suitably provided through an associated web server. Furthermore, the workstation may also include a protocol development suite allowing a trainer to tailor a training regime to an athlete's specific needs.

The processed information is preferably stored in a database allowing a trainer access to historical data about an athlete's progress and to adapt the 10 training regime accordingly. Optionally the trainer may receive intermediate reports regarding the athlete's performance compared with those responses required during the training session.

In still a further aspect of the present invention competitive sporting activity said activity, including:

15 a playing area, said area being defined by a plurality of remote units, said remote units providing a set of stimuli;

a plurality of athletes wherein each of the plurality of athletes is assigned the role of either a defensive player or an offensive player;

a game object for propulsion by the offensive players;

20 randomly generating a stimuli at a selected remote unit within the playing area assigned to the offensive players, to which the offensive players must move the game object;

said defensive players then being required to react to movements of said offensive player(s) in order to prevent said game object reaching the selected 25 remote unit.

In yet another aspect of the present invention there is provided a method of undertaking physical activity for exercise or competitive purposes, said method including the steps of:

providing a common activity area, said playing area being defined by a 30 plurality of remote units;

assigning athletes to at least two teams, said teams each including a plurality of athletes wherein each of the plurality of athletes is assigned the role of either a defensive player or an offensive player;

providing a game object propelled by the offensive players of said team;
randomly generating a stimuli identifying a team at a selected remote unit to
which the offensive players of the identified team must move the game object, and
wherein said defensive players react to the movements of said offensive players in
5 order to prevent said game object reaching the selected remote unit.

Preferably the game object is a projectile such as a ball, flying disc such as
a Frisbee or other suitable object.

Suitably the game may be played over one or more periods of a predefined
length. The periods may be a predefined time period or it may based on other
10 criteria such as a number of completion required to be performed by the offensive
players.

The players' actions within the activity may be governed by an appropriate
set of rules including full contact, partial contact and non-contact rules.

Suitably penalties may be imposed on the offensive players in response to
15 the defensive players interfering with the movement of the game object. The
penalties may include for example the defensive team holding onto the ball for a
set time before releasing, the defensive throwing the ball out of the grid for the
offensive team to retrieve, the exclusion of member of the offensive team from the
playing area for a set period of time or requiring the offensive players to return the
20 game object to a discrete location or "home base" assigned to the offensive team
within the playing area for a given time period.

Preferably the offensive and defensive players may intermittently
interchange roles, i.e. the defensive players become the offensive players for a
period and vice versa.

25 The term "athlete" as used herein, and similar terms including "player" or
"competitor", is merely meant to denote a user of the training apparatus or subject
of the training method of the invention. It will be appreciated that whilst a preferred
embodiment of invention is described in relation to human athletic type events, it
may also find application in sports and training activities of many kinds which may
30 involve interactions with play objects, equipment, animals or machines, such as in
the nature of football, snow skiing, horse riding and motor-racing.